t. 7. 1692]. *Amomum zedoaria* Christm. & Panzer, Linn. Pflanzensyst. 5: 12. 1779; Plenck, Ic. Pl. Med. 2: 12, t. 11. 1789.

Detailed descriptions are available in literature.

Flowering: June-August.

Speciments : S. ANDAMANS. Ferrargunj — Jirkatang, collected in vegetative condition and flowered under cultivation on 3 June 1978, *Balakrishnan* 6746 (PBL).

Distribution: India, Malaya and Java.

Notes: Commonly seen in waste grounds in Andaman and Great Nicobar Islands. A new record for these islands. See Burtt (l.c. 1977) for typification and nomenclature of this species. This species can be cultivated as an ornamental garden plant, as it grows profusely and very quickly.

BOTANICAL SURVEY OF INDIA,
ANDAMAN-NICOBAR CIRCLE,
PORT BLAIR 744 103,
October 6, 1982.

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35. AQUATIC KNOT WEEDS OF THE KASHMIR HIMALAYAS

(*With three plates*)

Aquatic knot weeds (320 species) represented by about 50 species with some doubtful varieties in the local flora, are of great interest to many people because they are aggressive invaders of lakes, reservoirs and other wet habitats and are capable of altering the ecological balance of large areas. In addition, they are taxonomically much complicated. Linnaeus (1753) included 26 species in the genus *Polygonum* L. Boisser (1879) divided the genus into 7 sections. Bentham and Hooker (1886) added 150 species and divided the genus into ten sections Jackson (1885) included 254 species and Hooker (1886) divided them into 11 sections. Tutin *et al.* (1964) and Cood and Cullen (1968) reduced the genus into 4-5 sections only. Small (1903) and Gross (1913) accepted the subdivisions of the genus *Polygonum* L. and treated its species as representing several genera. But due to the ambiguous nature of characters most of the authors in the last half century preferred to keep the genus undivided. (Bonner 1913, Danser 1927). However, during the last few decades the problem was reviewed and Hedberg (1946) and Hara (1966) clearly demonstrated more than one pollen morphotypes in the genus and divided it into few genera. In the present study the pollen morphotypes and the taxonomy of the existing species were studied which showed that the aquatic members of the present area fall in the genus *Persicaria* Mill. The pollen types differ from that of *Polygonum* s. str. in being tri — polyporate with murate reticulations. The aquatic species of the genus are:

Persicaria lapathifolia Gray	(= *Polygonum lapathifolium* L.)
Persicaria amphibia Gray	(= *Polygonum amphibium* L.)
Persicaria nepalensis Gross	(= *Polygonum nepalense* Meis).
Persicaria nodosa Opiz.	(= *Polygonum nodosum* Pers.)

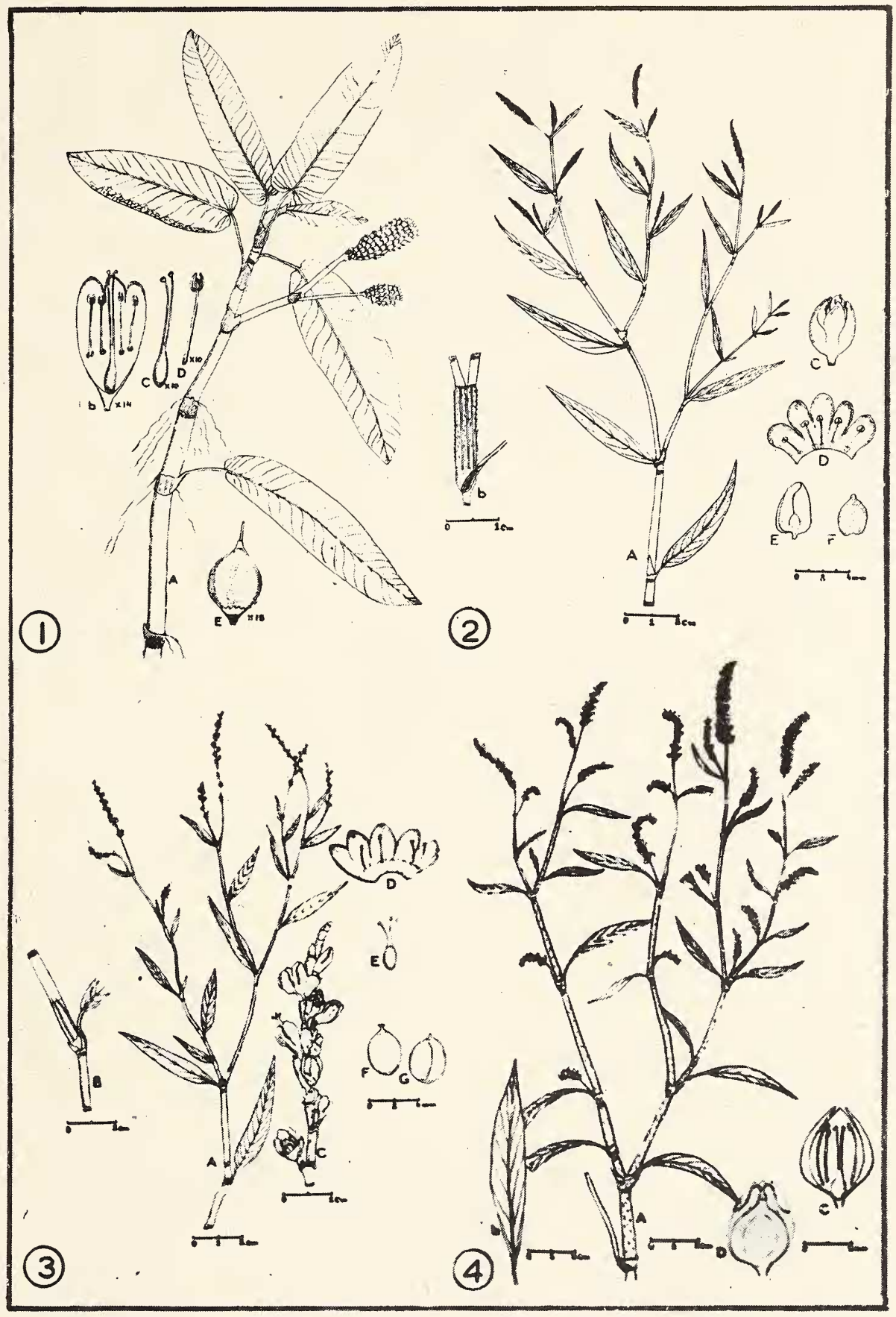

Fig. 1. *Persicaria amphibia* (L.) G.F. Gray: A. Habit; B. Flower showing the insertion of stamens; C. Ovary; D. Stamens; E. Mature nut.

Fig. 2. *Persicaria nodosa* (Pers.) Opiz.: A. Habit (upper portion); B. Ochrea; C. Flower; D. Petal dissected showing the arrangement of the stamens; E. Flower; F. Mature nut.

Fig. 3. *Persicaria punctata* (Elliot) Small.: A. Habit (Upper portion); B. Node showing the Ochrea; C. Portion of spike showing the arrangement of the flowers; D. Petals dissected showing the insertion of the stamens; E. Ovary; F-G. Mature nut showing variations.

Fig. 4. *Persicaria lapathifolia* (L.) S.F. Gray: A. Habit (showing upper portion); B. Leaf; C. Flower, 1.s. showing the arrangement of the stamens; D. Mature nut enclosed in a perianth.

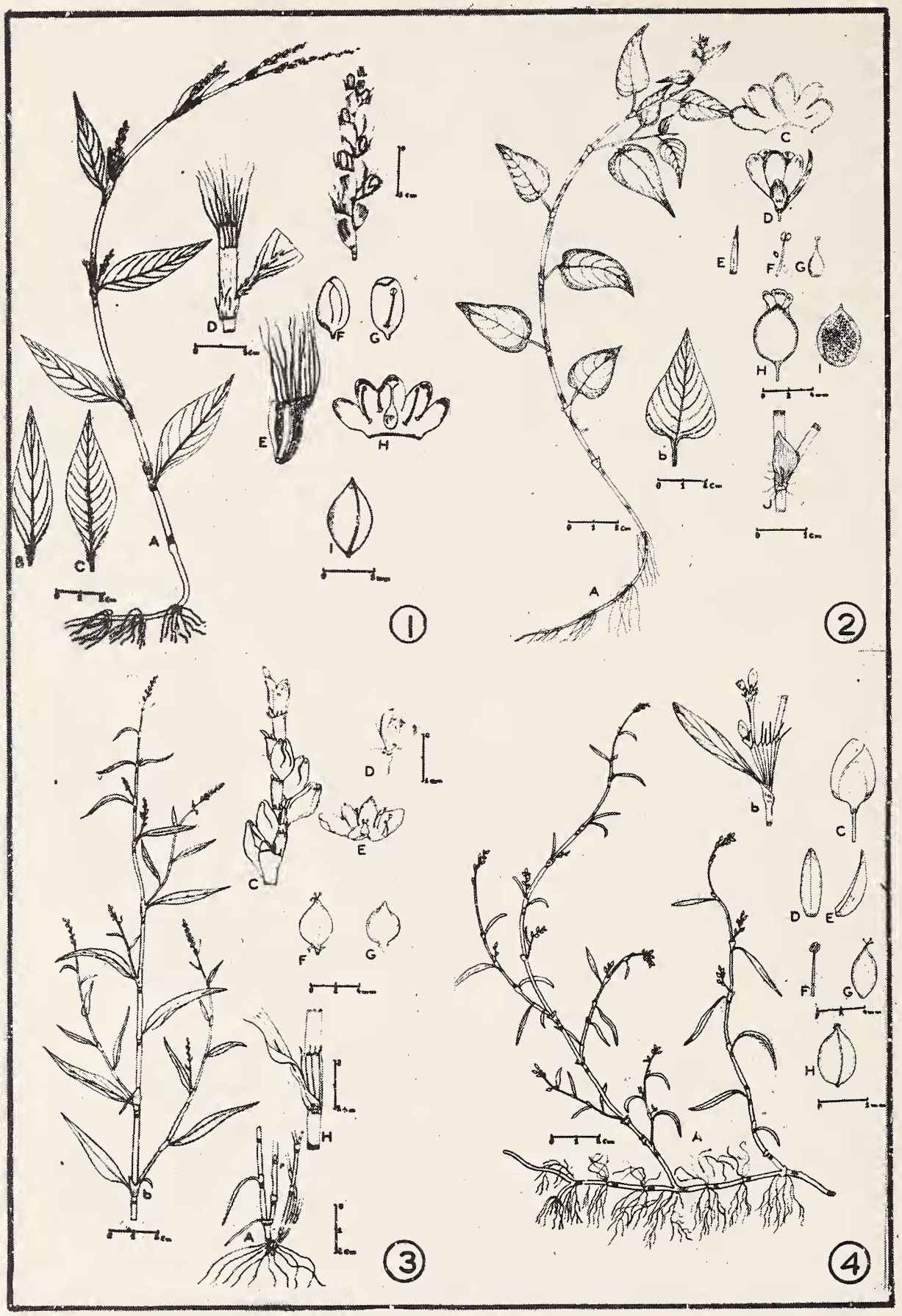

Fig. 1. *Persicaria hydropiper* var. *mite* (Schrank.) Majeed.: A. Habit; B-C. Leaf showing variation in size and shape; D. node with an ochrea; E. Ochrea showing long cilia; F. Flower; G-H. Petals showing the arrangement of the stamens and ovary; I. Mature nut; J. Portion of spike showing the arrangement of the flowers.

Fig. 2. *Persicaria nepalense* (Meissn) H. Gross.: A. Habit; B. Leaf. C. Corolla tube dissected; D. Flower; E. Involucral bract; F. Stamen; G. Ovary; H. Immature nut enclosed in perianth; I. Mature nut; J. Ochrea with cilia.

Fig. 3. *Persicaria hydropiper* (L.) Spach.: A. Lower portion of plant; B. Upper portion; C. Portion of spike showing the arrangement of the flowers; D. Flower arranged on the node; E. Corolla tube dissected; F. Immature nut; G. Mature nut; H. Node showing the ochrea and cilia.

Fig. 4. *Persicaria kawagoeana* (Makino) Nakai.: A. Habit showing decumbent nature and profuse roots; B. Node showing ochrea with cilia, floral spike and the leaves; C. Flower; D. Inner and E. Outer perianth; F. Stamens; G. Immature nut; H. Mature nut.

Persicaria hydropiper Spach	(= *Polygonum hydropiper* L.)
Persicaria kawagonena Nakai,	(= *Polygonum minus* Huds.)
Persicaria punctata Small,	(= *Polygonum punctatum* Elliot).
Persicaria hydropiper ssp. *mite* Majeed	(= *Polygonum mite* Schrank)

KEY TO THE SPECIES

1. Perianth segments 4-5 lobed; stamens not alternating with the glands. Pollen grains 3 colpate, colpi tapering both ends; exine with duplibacculate rods ..... *P. nepalensis*
1. Perianth segments 4-5 partite; stamens alternating with glands. Pollen grains 3 — polyporate; pores brochal, ellipsoidal — oval; exine sometimes with multibacculate rods.
   2. Perennial, rhizomatous herbs; ochrea without cilia.
      3. Marshy; erect, internodes solid, red dotted. Leaves linear-lanceolate; spikes white or light pink, long, lax, branched, pendulous. Pollen grains 5 porate, lumina mostly granulate ..... *P. lapathifolia*
      3. Aquatic; prostrate, decumbent, internodes fistular, smooth. Leaves dimorphic, mostly ovate, lanceolate; spikes reddish short, compact, never branched, erect. Pollen grains polyrugate; lumina with small bacculate rods..... *P. amphibia*
   2. Annual: rarely perenating by stolens; ochrea fringed with cilia or bristles
      4. Spikes dense, stout with crowded or overlapping flowers ..... *P. nodosa*
      4. Spikes lax, slender, flowers never crowded
         5. Steps sulcate; ochrea with 7-9 bristles; perianth segments eglandular. Seeds smooth..... ..... *P. hydropiper*
         5. Stems smooth, ochrea without bristles; perianth segments glandular. Seeds lenticular
            6. Stems glandular, leaves sessile or subsessile punctate ventrally; perianth ovate..... ..... *P. punctata*
            6. Stems glandular, leaves petiolate; never punctate perianth lanceolate
               7. Ochrea with long cilia, leaves linear lanceolate stigma 3 fid. Lumina with bacculate rods ..... *P. kawagoeana*
               7. Ochrea with short or equal cilia, leaves broadly lanceolate, stigma 2-fid. Lumina mostly granulose ..... *P. hydropiper* ssp. *mite*

PERSICARIA Mill. Gard. Diect. Abr. Ed. 4 (1754).

A cosmopolitan genus, represented by the following 8 aquatic or semi-aquatic species in this area. Some of the terrestrial species are endemic to the Kashmir Himalayas. Pollen grains colpate or porate (tritetracolpate or tripentaporate), mostly spherical, prolate, rarely subprolate in equatorial view, circular in polar view; colpi long reaching near the poles, more or less open without marginal thickenings; sexine thick may or may not be well differentiated into sexine and nexine; lumina mostly granulose or with small bacculate rods.

P. lapathifolia (L.) S. F. Gray. Nat. Arr. Br. Pl. 2: 270 (1821).

Polygonum lapathifolium L. Sp. Pl. 360 (1753); Hook. f. Fl. Brit. Ind. 5: 35 (1885).

Stout, prostrate perennial herbs, can be easily distinguished in the field: being bushy, steps red dotted, pubescent. Leaves narrowly lanceolate; upper ones sessile lower petiolate. Ochrea auricled, truncate, membranous; spikes lax axillary also terminal, branched or unbranched perianth fused at the base, broadly lanceolate, entire; styles 2. Seeds orbicular, with an apical beak 2.5 x 2 mm, with a central furrows, light

brown. Pollen grains 5 porate 21.9 x 21.6 μ, spherical in equatorial view circular in polar view; pores brochal, ellipsoidal, 1.8-2.7 x 1.7 μ; exine with multibacculate rods; rods 1.7-1.8 μ high; reticulations murate; muri 3.6-4 x 2-2.8 μ; lumina mostly granulate, sometimes with small bacculate rods.

Common in marshes near the sides of lakes and streams, also near wet meadows. Nagin lake AMK 660; Dal lake AMK 3811; Harwan AMK 3865.

Distribution. Himalayas, South west Asia, N. W. Africa, Europe.

P. amphibia (L.) S. F. Gray, Nat. Arr. Br. Pl. 2 : 268 (1821).

Polygonum amphibium L. Sp. Pl. 361 (1753); Hook. f. l.c. 34.

Prostrate, decumbent perennial herbs, can be easily distinguished in the field by having fistular internodes, trimorphic leaves; submerged ones ovate-ovate lanceolate, short petioled with cordate base; floating ones ovate, petiolate; upper ones oblong lanceolate; sessile. Ochrea tubular, truncate, parellel veined; spikes oblong, rosy red; perianth lanceolate, stigma capitate. Seeds orbicular, biconvex with an apical pointed end. Pollen grains polyrugate, 39 x 37.5 μ; spherical in equatorial view, circular in polar view; pores usually not visible; exine thick with multibacculate rods; rods 2-3 m high, reticulate, murate; muri 1.8-3.7 x 1.3-2 μ lumina mostly granulate.

Abundant in the lakes, irrigation canals, ditches, ponds and rivers. Also in marshes, swamps and in muddy wetlands, meadows. Common near the margins of floating islands. Anchar lake AMK 2024; Nowgam rakh AMK 663; Nagin lake AMK 3794.

Distribution. Cosmopolitan.

P. nepalensis (Meisn.) H. Gross in Engl., Bot. Jahrb. 49 : 277 (1913).

Polygonum nepalense Meissner. Monogr. Poly. 84. Pl. 7. f. 2. (1826); Hook. f. l.c. 41.

Prostrate annual, erect herbs, can be easily distinguished in the field by the hairy nodes. Leaves broadly ovate, acute, base truncate, hairy near the veins below. Ochrea membranous, hairy near the base. Perianth ovate, obtuse; stigma capitate. Seeds circular, biconvex, granular, dark brown. Pollen grains 3 colpate, 29.9-2.9 μ dia., spherical in equitorial view, circular in polar view; colpi medium — long, 12-14 μ high, tapering both ends; acute, exine with duplibacculate rods; reticulations murate; lumina with baculoid rods. Polar field index : 1:5.

Common in mud, at the edges of streams and ponds in the artificial reservoirs. Gulmerg AMK 3724 : Tangmerg (Ferozpur Nallah) AMK 2021.

Distribution: Afghanistan, Himalayas from Kashmir to Sikkim, India, China, Japan, Malaya.

P. kawagoeana (Makino) Nakai in Rigakkai 24: 300 (1926): Ito in Jour. Jap. Bot. 31; 173, 177 (1956).

Polygonum minus Huds. Fl. Angle. ed. 1: 148 (1762); Hook. f. l.c. 36.

Dwarf, gregarious annual herbs, can be readily distinguished from other species of the genus in having straggling roots with bunch of secondary rootlets near the nodes; stems mostly documbent, Ochrea tubular, truncate with long cilia. Perianth lanceolate; stigma 3 lobed. Seeds trigonous, smooth, 2 x 1.5 mm, shining, dark red with a short apical beak. Pollen grains 5 porate, 26.5-27.4 × 25-26.9 μ dia. spherical in equatorial view, circular in polar view; pores brochal, ellipsoidal — oval, 5.49 x 3.68 μ; exine with dupli or multibacculate rods; reticulations murate; lumina with bacculate rods.

Abundant in marshes, bogs in shallow water on the edges of ponds, lakes and streams.